

SOME AMPHIPODA AND ISOPODA FROM BARRINGTON TOPS (4600 ft. alt.) N.S.W.

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(Communicated by C. HEDLEY.)

With Twenty-two Text-figures.

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In January, 1916, I received from the authorities of the Australian Museum, a small collection of Amphipoda and Isopoda that had been gathered a short time previously by Mr. C. Hedley, on Barrington Tops near Dungog, New South Wales, at an altitude of 4,600 feet above sea-level.¹ On examination the collection proved to consist of four species, two *Isopoda* and two *Amphipoda*, there being one terrestrial and one fresh water representative of each group. The species are:—

- Isopoda*— Terrestrial, *Cubaris helmsianus* sp. nov.
Fresh water, *Phreatoicus shephardi* Sayce.
- Amphipoda*—Terrestrial, *Talitrus sylvaticus* Haswell.
Fresh water, *Gammarus barringtonensis*,
sp. nov.

Two of these species are new, all of them present points of individual interest, their geographical distribution is important, and a brief account of them is therefore desirable.

¹ Just before the New England Plateau dips into the trench of the Hunter valley, it rises at Barrington Tops to a height of five thousand feet. Here the climate proper to such an altitude nourishes a subalpine fauna and flora on an island, as it were, set in a subtropical sea. So inaccessible is this spot that it has hitherto escaped scientific examination. Under the auspices of the West Maitland Scientific Society, an excursion to it (described in the *Sydney Morning Herald*, 1/4/16) was arranged by our member, Mr. J. W. Enright, for the Christmas holidays of 1915. A botanist, a geologist, and several zoologists joined this party and accomplished useful work. The present communication, which will, it is hoped, be followed by several others, was preceded by articles on the Coleoptera by Messrs. Sloane and Carter, *Proc. Linn. Soc. N.S.W.*, xli., 1916, pp. 196-214, and a note on a Moss by W. W. Watts, *op. cit.*, p. 385.—C.H.

TALITRUS SYLVATICUS Haswell (figs. 1 to 3).

Talitrus sylvaticus Haswell, 1879, Proc. Linn. Soc. N.S.W., vol. iv, p. 246, pl. vii, fig. 1.

Talitrus sylvaticus Haswell in Sayce, 1909, Proc. Roy. Soc., Victoria, vol. xxii, p. 30, pl. xi (with synonymy).

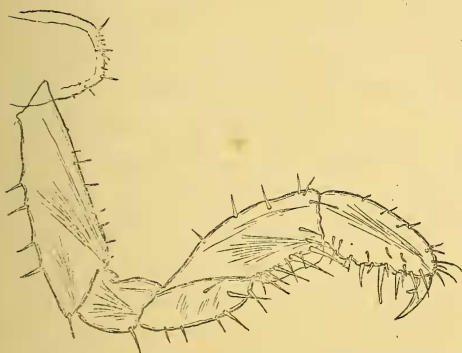


Fig. 1. *Talitrus sylvaticus*, first gnathopod.

Of this species there was only a single representative which was included in the tube containing the *Gammarus barringtonensis*. *Talitrus sylvaticus* is strictly a terrestrial form found under decay-

ing leaves, etc., but may be occasionally taken in damper places, as appears to be the case in this instance.

There has been some confusion in connection with the description of the species, and as Dr. Calman¹ has pointed out, it is possible that more than one species has been included under this name by different authors. The species was redescribed by the late Mr. Sayce in 1909, and at the same time was distinguished from a second species, *Talitrus kershawi*, found associated with it at a number of localities in Victoria.

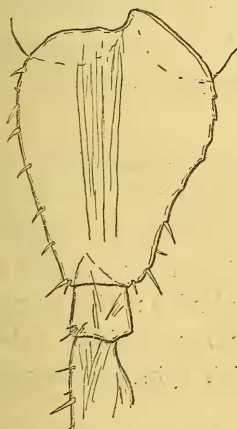


Fig. 2. *Talitrus sylvaticus*, basal portion of third pereopod.

The single specimen from Barrington Tops agrees very closely with Sayce's description of *T. sylvaticus*,

¹ Calman, *Ann. and Mag. Nat. Hist.*, Ser. 8, vol. 10, p. 135.



Fig. 3. *Talitrus sylvaticus*, maxilliped.

and I have been able to compare it with specimens collected many years ago by the late R. Helms near the top of Mount Kosciusko, and find that it also agrees precisely with these specimens. The general external appearance of these terrestrial Amphipoda is very much the same in species found in widely separated lands, and it is not always easy to get definite points of distinction that can be readily examined. Sayce has pointed out that the species in question is a genuine species of *Talitrus*, since the gnathopoda of the males and females are almost identical in structure; it is thus clearly marked off from species of *Parorchestia*, in which the males have the second gnathopoda developed into powerful subchelate organs. In species of *Parorchestia*, however, the males are often very rare, and the same thing may be the case with *Talitrus*, so that it is not always easy to apply this sexual difference. In the present case, fortunately, *Talitrus sylvaticus* can apparently be pretty readily recognised by the three following points:—

(1) *The first gnathopod.*—In this, the side-plate distinctly narrows distally, the carpus expands distally, is much longer than the propod, and has on the under or posterior side, a small sub-pellucid area marked off from the rest of the joint by a fairly regular row of spinules; the propod narrows towards the dactyl, there is no appreciable palm, but the posterior margin is armed with spines of varying sizes, (see fig. 1).

(2) *The third pereopod* has the basal joint distinctly narrowing distally, the posterior margin being irregularly serrate and provided with a few spinules chiefly on the lower part, (see fig. 2).

(3) In the *maxillipeds* there are also distinctive features, the chief of which is that the outer lobe narrows towards the apex, so that this is distinctly subacute. It is tipped with a few fine setae, and the inner margin bears a few stouter setae somewhat widely separated, (see fig. 3). In *T. kershawi*, the outer lobe has the apex "rather broader, distinctly indented, and clothed with two tufts of setae, separated by the indentation."¹ In *Parorchestia sylvicola* Dana, the terrestrial land-hopper common throughout New Zealand, the maxillipeds are considerably different, and, in particular, have the outer lobe well rounded and fringed with numerous spinules.

Talitrus sylvaticus appears to be very common in Tasmania, and is also found along the coastal and mountainous regions of Victoria and New South Wales. Sayce records that it is very common throughout Victoria at all elevations, and that he has taken it under dead sea-weed just above tide-level at several places along the coast. The other species, *T. kershawi*, was found by Sayce at a considerable number of localities in Victoria, but has not yet been observed elsewhere. No species of *Talitrus* has, as yet, been recorded from New Zealand, where the genus appears to be represented by the common and widely distributed land-hopper, *Parorchestia sylvicola* Dana. At the Seychelles and Madagascar, however, there is a closely allied species, *Talitrus alluaudi* Chevreux, which appears to be closely related to *T. sylvaticus*; it has also been recorded from hothouses in France, to which it had doubtless been accidentally conveyed from its original habitat. In 1912, Dr. Calman² described another terrestrial species, *T. hortulanus* from specimens obtained in the gardens of Kew; it appears to be pretty close to the three species already mentioned,

¹ Sayce, 1909, p. 33

² Calman, *Ann. and Mag. Nat. Hist.*, Ser. 8, vol. 1), p. 132.

but may be distinguished by the points given by Calman. In it the outer lobe of the maxilliped is broadly rounded.

Calman¹ has pointed out that there is some discrepancy in the published accounts of the pleopoda of *T. sylvaticus*. G. M. Thomson and Sayce state that they are unable to find the third pair, while Chevreux, who examined specimens from Mount Kosciusko sent to him by myself, states that it resembles the first two pairs in being biramous, although of smaller size, and this is confirmed by Calman by the examination of two specimens received from the Australian Museum. I have not been able to examine the pleopoda in the single specimen from Barrington Tops. It would not be surprising if there are considerable individual differences in the development of these pleopoda, since they are to be looked upon as functionless vestigial organs in a species that is characteristically terrestrial.

GAMMARUS BARRINGTONENSIS, sp. nov. (figs. 4 to 12).

In the collection were a few specimens of varying sizes of a Gammarid which it is not easy to identify with any of the somewhat numerous species of this group already described from Australia. In general appearance, in the structure of the antennae, gnathopods, peraeopods and telson, it presents very considerable resemblances to *Gammarus australis* Sayce,² found in different localities in Victoria, though the long setae on the appendages appear to be much less numerous. It is, however, clearly marked off from this species and from the allied species, *Gammarus haasei* Sayce,³ also found in Victoria, by the structure of the third uropod which has the inner ramus quite small and vestigial, as in the genera *Niphargus* and *Neoniphargus*. In this character and also in the gnathopods, antennae, etc.,

¹ Calman, *loc. cit.*, p. 135.

² Sayce, *Proc. Roy. Soc. Victoria*, vol. 13, (new series) p. 233.

³ Sayce, *loc. cit.*, vol. 15, p. 53.

the Barrington Tops specimen comes pretty close to *Niphargus mortoni* G. M. Thomson,¹ from Mount Wellington in Tasmania, and I am almost inclined to look upon it as a variety of this species. However, as there are several other nearly allied species, with none of which our specimens exactly agree, it will be safer to describe it in the meantime as a new species. *Niphargus mortoni* was placed under the genus *Niphargus* by Mr. G. M. Thomson with considerable hesitation, for, as he pointed out, it differs from that genus in several points, though Stebbing² in 1910, leaves it under this genus. I agree with Mr. Geoffrey W. Smith³ that this species, as well as the others described by him, are perhaps better placed under the genus *Gammarus*, since, except in the minute inner joint of the uropod, they very closely agree with the species *G. australis* Sayce and *G. haasei* Sayce, which certainly appear to be rightly referred to *Gammarus*.

The species now under consideration, on the whole seems nearest to *G. australis* Sayce, but differs chiefly in being less abundantly supplied with long setae. The following description therefore will be sufficient.

Specific Diagnosis.—*Female.*—Segments of the urus with a few long setae on the dorsal surface, one or two small ones being also found on the last two segments of the pleon; on the last segment of urus there is a small spine in addition to the long setae. Eyes small, oval. First four sideplates deeper than their segments, nearly twice as deep as broad, the inferior margin with a few short setae widely separated; in the first sideplate these extend along a portion of the anterior margin. Segments of pleon as in *G. australis*. Upper antennae (fig. 4) about half the length of the body;

¹ Thomson, *Proc. Roy. Soc., Tasmania* for 1892, p. 24 (of separate copy).

² Stebbing, *Australian Museum, Mem.* 4, p. 641.

³ G. W. Smith, *Trans. Linn. Soc., Zool.*, vol. 11, p. 76.



Fig. 4. *Gammarus barringtonensis*, first antenna.

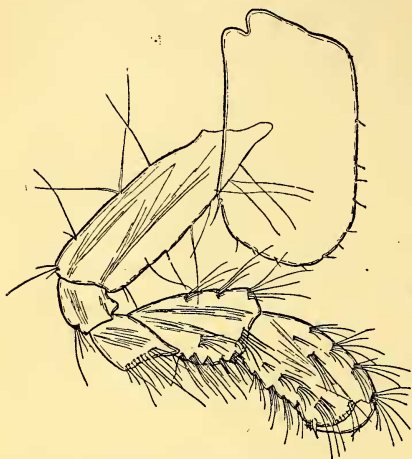


Fig. 5. *Gammarus barringtonensis*, first gnathopod of female.



Fig. 6. *Gammarus barringtonensis*, second gnathopod of female.

the first joint of peduncle stout with a few spinules at distal extremity, second joint much more slender and a little shorter third segment rather more than half as long as the second; secondary flagellum usually with four joints, primary flagellum with about forty. Lower antennae about half as long as the upper; peduncle and flagellum with numerous long setae.

Mouth parts the same as in *G. australis*. First gnathopod (fig. 5) with propod about as long as the carpus, both with numerous tufts of long setae; palm slightly oblique, straight, finger narrowing somewhat abruptly about the middle and ending acutely. Second gnathopod (fig. 6) longer and more slender than the first; propod slightly narrower than the carpus, palm rather more oblique than in the

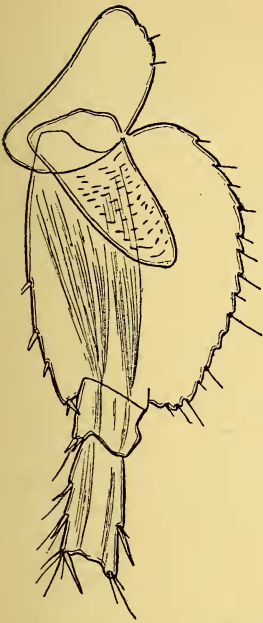


Fig. 7. *Gammarus barringtonensis*, basal portion of fifth pereopod.

The description given above applies to the female. I have only a few specimens and have not been able to work out the sexual differences fully.



Fig. 8. *Gammarus barringtonensis*, "accessory branchia."



Fig. 9. *Gammarus barringtonensis*, first uropod.



Fig. 10. *Gammarus barringtonensis*, second uropod.

first. Third, fourth and fifth (fig. 7) pereopoda with the basal joint moderately expanded, posterior margin serrate. Terminal uropoda (fig. 11) projecting beyond the others, basal joint stout and short, with several spines and long setae at the extremity, outer ramus about three times as long as peduncle, with about five groups of spines and slender setae; second joint very short; inner ramus very small, triangular, and bearing one small seta. Telson (fig. 12) cleft to the base, each lobe with extremity rounded and bearing on the outer and posterior margins four or five long slender setae, two or three other setae arising from the upper surface.



Fig. 11. *Gammarus barringtonensis*,
third uropod.



Fig. 12. *Gammarus barringtonensis*, telson.

Colour (in spirit) nearly white.

Length of largest specimen. 11 mm.

Locality, Barrington Tops, 4,600 ft., N.S.W. (*C. Hedley*).

Remarks.—On some of the segments of the peraeon there are finger-like appendages which appear to be of the same nature as the “simple accessory branchiae” described in *Hyaella jelskii* Wrzesn, and *H. dybowski* Wrzesn. These are present on the last three segments of the peraeon and possibly also on the two segments anterior to these and appear to arise from the sternum of the segment internal to the branchia, but I cannot determine their exact occurrence and attachment without sacrificing too many of the few somewhat imperfect specimens at my disposal. They (fig. 8) are cylindrical, curved, tapering towards the subacute apex and have the interior closely filled with round refractive bodies looking like oil globules. I doubt if they are branchial in function, but, whatever their nature, it is interesting to note that they are found in species of two different genera in localities high above the sea-level, viz. *Gammarus* in Australia at a height of 4,600 feet, and *Hyaella* on the Cordilleras in America, at a height of about 7,000 feet. Appendages, apparently similar, are found in *Waldeckia zschauii* Pfeffer and other Antarctic Amphipoda.¹

The fresh water Gammarids of Australia and Tasmania described by Thomson, Sayce and G. W. Smith are already

¹ Chilton, Amphipoda of “Scotia” Expedition, *Trans. Roy. Soc., Edinburgh*, vol. 48. p. 472.

fairly numerous, and, just as in Europe and North America, they include surface forms with eyes and blind subterranean forms, both being sometimes found together in surface streams. The difficulty of classifying these forms is already considerable and will probably be greater when other specimens from intermediate localities are examined, though when a sufficient number of these are accurately known, it will doubtless be possible to trace out the lines upon which development has taken place. It seems likely that they have arisen from a form that could be rightly included in the genus *Gammarus*, and that is perhaps still represented by *G. australis* Sayce. From this, there have arisen forms resembling the genus *Niphargus* of Europe, but it is clear that the development of these in Australia has been independent of that in Europe, and that, as G. W. Smith¹ has pointed out, we have here a case of convergence that is well worthy of attentive study. The fresh water Amphipoda of Australia have differentiated into genera and species simulating those of Europe, much in the same way as the marsupial mammals have differentiated into groups parallel to those of the true mammals.

PHREATOICUS SHEPHARDI Sayce (figs. 13 to 17).

Phreatoicus shephardi Sayce, Proc. Roy. Soc. Victoria, vol. 13, p. 26, pl. 3.

Of this species there were numerous specimens in the collection. Mr. Hedley has been kind enough to give me the following particulars as to the locality and circumstances under which they were taken. He says that they came from a height of nearly 5,000 feet, at the source of the river Manning, N.S.W., in South Latitude 32°, much further north, therefore, than previous records of the species. The surroundings were quite subalpine, near by was a *Fagus* forest; indeed, the spot is a subalpine island in a subtropical area. The broad, shallow valleys of the

¹ G. W. Smith, *loc. cit.*, p. 77.

highest part of the plateau originate in large swamps that are almost peat bogs. Characteristic of such swamps is a large moss forming cushions a yard across, and the *Phreatoicus* lives in this moss. Mr. Hedley says they were quite abundant, three or four being found in each handful of moss, sometimes among the stems, but more often among the muddy roots.

These specimens clearly belong to the species named above, and on the whole agree well with the description given by Sayce, although naturally the numbers of spines found on the different parts of the body and appendages are not always precisely the same as those given in his description, which was drawn up from a single male specimen. The lower antenna (which was lost in Sayce's specimen) is as long as the head and first four segments of the peraeon, and agrees in general structure with that of *P. australis*.

I have numerous female specimens, and am, therefore, able to add the description of the female. Sayce's speci-



Fig. 13. *Phreatoicus shephardi*, first peraeopod (gnathopod) of male.

men was a male, but possibly not fully mature. The male specimens have the peraeon more slender than in the female, and somewhat longer in proportion to the pleon. Sayce stated that in *P. shephardi* the pleon is relatively longer than in *P. australis* Chilton; this appears to be true to some extent for the females, but in the males, the proportions of those specimens that I have measured are almost the same as in *P. australis*.



Fig. 14. *Phreatoicus shephardi*, fourth pereopod of male.

The first leg or gnathopod in the fully developed male (fig. 13) has the propod very greatly enlarged, its anterior margin being extremely convex, the palm oblique, nearly straight, and with irregular serrations which are most marked towards the base of the dactyl. The fourth pair of legs (fig. 14) is also modified in the male somewhat in the same way as it is in *P. australis*. The merus, carpus and propod are all short, subequal, the propod has the

anterior margin very convex, the posterior is produced at the articulation of the dactyl into a prominent stout tooth, and the rest of this margin forms a short palm defined by three strong spines, against which the strongly curved dactyl closely impinges, the whole constituting a powerful subchelate appendage. The relative proportions of the joints and the setae on them will be readily seen from the figure, and need not be described in detail.



Fig. 15. *Phreatoicus shephardi*, first pereopod (gnathopod) of female.

In the female the gnathopod (fig. 15) is of the same general shape as in the male, but is much smaller, the propod being only slightly enlarged, the palm straight and without evident serrations. The fourth pair of legs is not specially modified, but is similar to the second which is shown in fig.

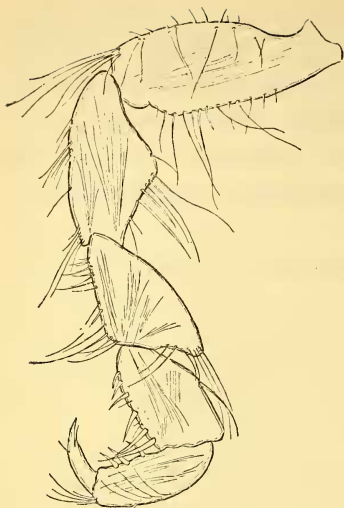


Fig. 16. *Phreatoicus shephardi*, second gnathopod of female.

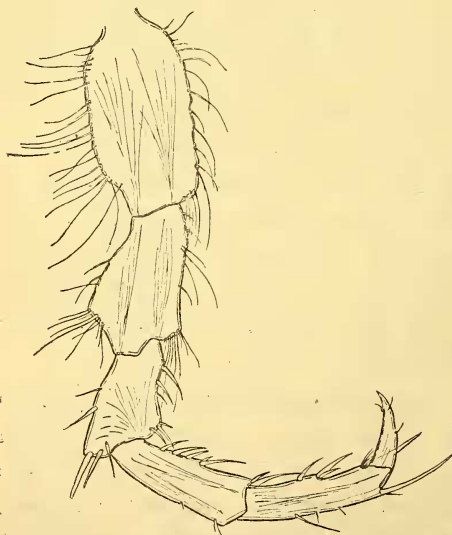


Fig. 17. *Phreatoicus shephardi*, seventh peraeopod.

from Cape Colony, South Africa.

16; the second, third and fourth pairs of legs are subequal, and all somewhat longer and more powerful than the gnathopod; the fifth, sixth and seventh increase regularly in length; the seventh is shown in fig. 17.

Some of the females bear eggs in the brood pouch which is formed of plates corresponding apparently to the first, second, third and fourth appendages of the peraeon; in one specimen examined there were about a dozen eggs.

This species, as already pointed out by Sayce, is pretty nearly allied to *P. australis*, but differs in the absence of eyes, in the character of the spines on the uropods, and in a few details of the mouth parts. Other species of the genus occur in Australia, Tasmania and New Zealand, and another, *P. capensis* Barnard,¹ has recently been described

¹ K. H. Barnard, *Annals South African Museum*, vol. 10, p. 231.

CUBARIS HELMSIANUS sp. nov. (figs. 18 to 22).

Specific diagnosis.—Body (fig. 18) oblong oval, fairly convex, the side portions of the segments wide, projecting slightly outwards. Whole surface minutely squamate. Dorsal surface of head uneven, with a slight groove parallel to the hind margin, and the portions between it and the eyes slightly raised. Segments of peraeon usually with indistinct tubercles, about six or seven on each side of median line but sometimes fewer on the posterior segments, median portion of each segment sometimes free from tubercles.

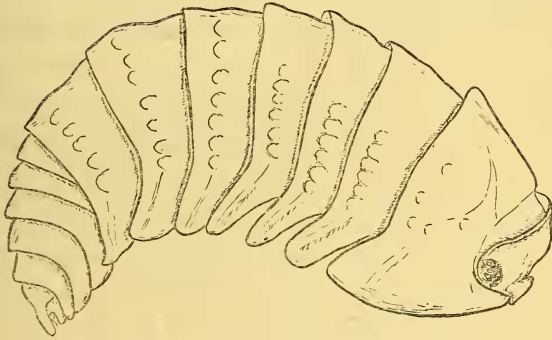


Fig. 18. *Cubaris helmsianus*, side view of animal.

Head (fig. 19) rather more than twice as broad as long. Epistome (fig. 20) with upper margin reaching in advance of the front, and with a deep triangular depression and notch in the middle.



Fig. 19. *Cubaris helmsianus*, head seen from above.

Eyes of moderate size, convex, projecting beyond the lateral margin of the head.

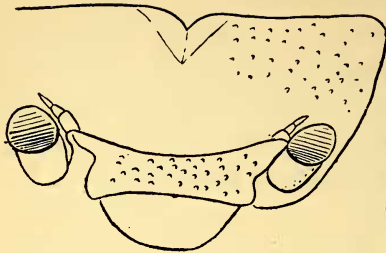


Fig. 20. *Cubaris helmsianus*, ventral view of anterior part of head showing epistome, first antenna and upper lip.

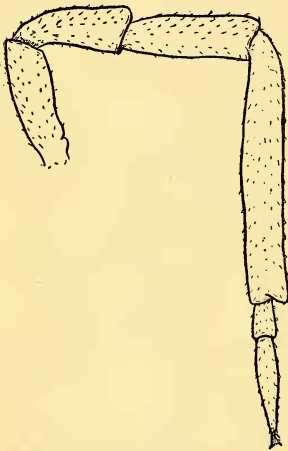


Fig. 21. *Cubaris helmsianus*, second antenna.

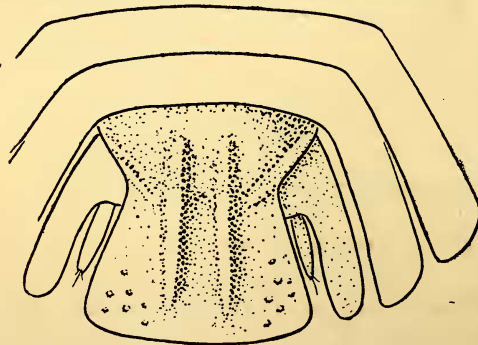


Fig. 22. *Cubarus helmsianus*, dorsal view of posterior portion of pleon and uropoda.

First segment of peraeon longer than the others, its side-plate produced anteriorly beyond the eyes and nearly to the level of the anterior margin of the head, this portion recurved so as to be nearly horizontal, posteriorly it extends in a triangular lobe

with rounded apex nearly to the level of the posterior margin of the second segment. Side plates of the first and second segments with margins thin, inner surface with a slight ridge ending in a small tooth. Second, third, and fourth sideplates rather narrow, each with an oblique ridge running downwards and backwards on the outer surface, fifth, sixth and seventh sideplates progressively broader and with the ridge less distinct.

Sideplates of the third, fourth, and fifth segments of pleon well developed, broad, rectangular. Terminal segment (fig. 22) longer than broad, constricted near the middle, posterior margin

straight or very slightly convex, its upper surface bearing two longitudinal ridges with a shallow between them.

Antenna (fig. 21) with last joint of peduncle longer than the two preceding together, flagellum as long as penultimate joint of peduncle, its first joint about one-third the length of the second.

Peduncle of uropoda much longer than broad, extremity rounded, outer ramus small, not reaching to the end of peduncle, inner ramus reaching nearly to the end of the anal segment.

Length 11 mm. *Breadth* 5.5 mm. *Height* about 2.5 mm.

Colour brown or dark brown, with marblings of a lighter colour.

Localities. Barrington Tops, (4,600 feet), N.S.W. (C. Hedley); Mount Kosciusko, (R. Helms).

This species appears to belong to Section VI in Budde-Lund's Revision¹ of the genus *Cubaris* (which he called *Spherillo*), the type of the section being *Cubaris ambitiosus* (Budde-Lund), a species very common throughout the greater part of New Zealand. It differs from that species, however, in being less convex, and in having the sideplates broader and projecting slightly outwards; this is particularly noticeable in the anterior part of the first side-plate. It is also distinguished from *C. ambitiosus* by the notch in the upper margin of the epistome, and by the two longitudinal ridges on the terminal segments.

The species also appears to be fairly close to *C. cinctutus* (Kinahan), a species which has been recorded from the Loyalty Islands by Stebbing,² and from New Caledonia by Budde-Lund. In that species, however, the epistome is produced to a much greater extent in advance of the head,

¹ G. Budde-Lund, Revision Crustacea Isopoda Terrestria, Copenhagen n 1904, p. 52.

² T. K. R. Stebbing, Willey's Zoological Results, p. 651.

and in place of the triangular notch has a median fissure; on the terminal segment there is a faint longitudinal sulcus or stria, but there are no evident ridges, as in *C. helmsianus*.

From Barrington Tops, I have three specimens, the largest, which has the dimensions given above, is much lighter in colour than the other two, being of a reddish brown, while the others are dark brown or almost black; in all there are marblings of lighter colour. The longitudinal ridges on the terminal segment also seem to vary in development; in the two darker specimens they are evident, particularly in one of them, while in the lighter-coloured specimen a faint longitudinal sulcus can be made out, but hardly any trace of the ridges.

In addition to the Barrington Tops specimens, I have three specimens collected on Mount Kosciusko many years ago by the late Mr. R. Helms, and forwarded to me by the Australian Museum, but hitherto undescribed. These are all rather lighter in colour than the Barrington Tops specimens, but agree in the notch in the epistome, the ridges on the terminal segments, etc. Some of them still bear the antennae which I am therefore able to figure and describe; they have been broken off in all the specimens from Barrington Tops.

In all these specimens the surface of the segments is somewhat uneven, generally forming a transverse row of indistinct tubercles, a little anterior to the posterior margin of the segment. These tubercles vary in number and in prominence; usually there appear to be six or seven on each side of the median line with rather fewer on the posterior segments, and they are sometimes less distinct near the median line. I have one specimen from Grafton, N.S.W., sent me by R. Helms in 1894, which I think belongs to *C. helmsianus*, and in that the tubercles on the segments of the peraeon and the ridges on the terminal segment of the pleon are much more distinctly marked.